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LUMINOUS BINARY SUPERSOFT X-RAY SOURCES

GRANT NAG5-10705

PROGRESS REPORT

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First Year Report on NAG5-10705 (PA 1640)

This grant was for the study of Luminous Supersoft X-Ray Sources (SSSs). During the first year we have completed a number of projects and have started new projects. Our projects are described below.

1. Time variability of SSSs

CAL 83 is one of the “flagship” sources defining the SSS class. We studied the correlation between its optical variability (as measured by the MACHO team) and its X-ray variability (including all measurements by all X-ray missions). The results are consistent with photospheric variations. This work, published in A&A, was carried out by the PI and Co-I Jochen Greiner.

2. SSSs in M31

Most of our efforts have been directed toward the detection, identification and study of SSSs in M31. We have published a long ApJ paper, have given presentations at the Chandra Symposium, the XMM meeting, the APS/AAS April meeting, and have 2 papers in preparation. This work has been carried out by a well-coordinated group of investigators, including the PI, Jochen Greiner, Michael Garcia, Francis Primini, Stephen S. Murray, Albert Kong, Pauling Barmby, and Shannon Curry,

The challenges are:

a. Detecting the sources.

The first data set we analyzed was apparently disappointing for the study of SSSs, because very few sources were detected in a region expected to house 5-9 bright sources. We worked hard on our detection procedures; this work led to new results on M31 globular clusters and provided the verification we needed that our detection procedures were sound.

b. Selection of SSSs

Given a set of some 500 X-ray sources, it was necessary to determine which belong to the SSS class. This was not as straightforward as had been previously assumed. The procedure we worked out identifies ~25 SSSs in M31. This procedure has spin-offs for the study of other galaxies, and we are presently exploring this new avenue of research, even as we study the implications of our M31 results.

M31 Results to Date

Subjecting our complete data sets to the careful analysis procedures we have developed has led to some exciting new results.

- a. The bulge of M31 houses a significant number (~16) of SSSs. Some of these may be the remnants of giants that were tidally stripped by the central massive (~30 million solar mass) black hole. Others may be the types of SSS X-ray binaries we have observed in our own Galaxy and in the Magellanic Clouds. We are

Universe in the XMM-Newton and Chandra Era", 26-30 November 2001, ESTEC, The Netherlands.

Di Stefano, R., Greiner, J., Murray, S.S., Garcia, M.R., Kong, A.K.H. 2002, in the Proceedings of the Symposium "New Visions of the X-ray Universe in the XMM-Newton and Chandra Era", 26-30 November 2001, ESTEC, The Netherlands.

Kong, A.K.H., Garcia, M.R., Primini, F.A., Di Stefano, R., Murray, S.S. 2002, in the Proceedings of the Symposium "New Visions of the X-ray Universe in the XMM-Newton and Chandra Era", 26-30 November 2001, ESTEC, The Netherlands.

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Murray, S.S. 2002, poster in APS/HEAD Meeting

Di Stefano, R., Kong, A., Primini, F.A., Garcia, M.R., Greiner, J., Kaaret, P., Murray, S.S., Barmby, P., Curry, S., Massey, P., Williams, B., Hodge, P. 2002, poster in APS/HEAD Meeting